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SECTION 304 – AGGREGATE BASE COURSE

304.1 – GENERAL

Base courses are placed on a carefully prepared subgrade to provide load bearing capacity and a relatively frost-free base for pavement. The width, thickness, and kind of base items have been determined in the design stage and will be shown on the typical section, the cross sections, and the profile. The requirements for base course materials will vary depending on the size and type of project. Some of the gradation specifications may fall under the “modified “ classification if the total yardage is less than 5000 cy (3000 cubic meters). It may be necessary to submit samples of the stone aggregate to the Materials and Research Bureau for hardness testing. The Contract Administrator should be familiar with the intent of the structural section so that when the subgrade conditions change, the need for a change in the depth of the base materials will be recognized. It is not the responsibility of the State personnel to accept or reject material in a pit or at a stockpile location. The sampling and testing of base course materials for acceptance must only take place in the roadway. It is not uncommon to see a contractor request to substitute gravel for the sand layer. This would normally be approved with the gravel in the sand layer to be paid at the sand price and the placement of the gravel to be in layers corresponding to acceptable compaction. It is important to remember that the base courses are the foundation of your roadway and that the gradation of your select materials can dictate the performance of the roadway through time.

Most base materials come from pits that are for the sole use of one project. Where the Contractor proposes a pit that will serve more than one project, or where materials may come from a commercial source, discuss this with the District Construction Engineer prior to making any commitment to the Contractor. Although the state is not responsible for determining the quantities in a pit, the appropriate pit agreement forms must be filled out prior to excavating any material. If the material is to come from a new privately owned source, archeological and wetlands review would also be necessary along with approval from the municipality.

304.2 – MATERIALS

Current construction plans usually require sand, gravel, and crushed gravel for base course materials. Depletion of nearby gravel sources has necessitated an increased use of crushed stone base courses for major road projects. Contract Administrators should check the current Standard Specifications and Special Provisions for the latest material descriptions.

It is the Contractor’s responsibility to locate a suitable source for base course materials. The Contract Administrator should monitor the Contractor’s source in order to be familiar with the quality, quantity, haul routes, and potential water pollution problems. Various federal and state agencies require permits before excavation can be allowed, and local governments often require bonding before hauling on local roads. The Contractor must submit any necessary plans for water pollution control along with the necessary permits before the District Construction Engineer can grant approval for pit operation.

The Contractor shall sample materials in the pit and test them for informational purposes. Once the pit is chosen, the Contract Administrator should send a sample of the stone portion to the Bureau of Materials and Research for a wear test (see “Testing Fine and Coarse Aggregate for Gradation” in Section 704 of this Manual for the test procedure). Although gradation testing from pit samples may be satisfactory, the samples taken in the roadway after placement prove the quality of the work. A guideline for testing, as outlined in the “NHDOT Guide to Frequency of Sampling and Testing” in Section 703 of this Manual, is one sample per 5000cy (3000 cubic meters), plus additional testing when observation indicates a change in material or when problems with segregation occur.

304.3 – CONSTRUCTION OPERATIONS

Design engineers select base course materials for a road construction project with a design gradation satisfying particular project requirements and considering product availability. Crushed aggregate base course material should be manufactured with minimum variation from the design gradation.

In addition to meeting gradation specifications, the material must be well mixed with little segregation. Crushed aggregates should maintain this homogeneous quality from production to placement in the roadway. The Specifications describe proper manufacturing and storage operations; the Contract Administrator can ensure a quality product with periodic inspections of the crushing and stockpiling operations.

The use of crushed stone as a base course material requires particular attention to placing methods. Project Specifications detail methods intended to avoid segregation of the material during placement. Segregation cannot be completely eliminated, but careful construction methods can minimize it. Crushed aggregates should be dumped on the course being placed, then immediately and uniformly spread with a minimum of blading onto the previously placed base course. Dumping in piles should be avoided. If the Contractor’s operation does not include equipment for immediate spreading, the Contract Administrator should consider a temporary suspension of the operation.

The Contract Administrator should check the latest Specifications and Special Provisions for compaction requirements and maximum depths of lifts. Uniform and thorough compaction at the optimum moisture content of the material is essential to a good base course. The Contractor’s method of operation should include provisions for watering acknowledging that over watering can cause a loss of subgrade support. Vibratory rollers are more efficient for compaction of densely graded base materials. Steel-wheeled static rollers are less effective for full depth compaction, especially at depths greater than 4” (100 mm). Rubber-tired rollers are useful in “sealing” the base course for asphalt surface treatment if specified. The Contractor should avoid over-rolling as this could “flush” fines to the surface, resulting in a poor bonding surface for asphalt courses.

A carefully constructed, fully compacted base should be immediately fine graded for paving. The Contract Administrator should consult the Specifications for fine grading. The Contractor should be discouraged from hauling or allowing traffic on the completed base course prior to paving.

SECTION 306 – RECLAIMED STABILIZED BASE

306.1 – GENERAL

Conservation of sand and gravel has resulted in the frequent re-use of existing bituminous pavements and base courses. Plans, typicals, and specifications will dictate the area to be covered and the desired depth of reclaim stabilized base to be placed. Often this area is not the same as the existing paved area. Since the depth of the reclaiming process varies with pavement thickness, considerable care and effort must be taken to estimate the quantity of reclaim material that is being generated to ensure there is sufficient quantity to be placed on the new roadway.

In some projects the intent is to simply pulverize and mix the existing bituminous surface with an approximately equal depth of underlying gravel in place. Often in these cases once the reclaimed material is pulverized and mixed it is simply fine graded, compacted, and paved over without modifying the reclaimed material to meet a certain gradation and asphalt content.

In some projects the reclaimed material is required to meet a specific gradation and/or asphalt content specification. These projects should contain items for stone and asphalt to be used as necessary to make the reclaimed material meet the specification.

In other projects the intent is for the reclaimed material to be removed, subgrade profile and slope adjusted to the new design, and then the reclaim material is to be spread out and fine graded for paving. Often these contracts will contain an item called crushed gravel for shimming. This item is to be used to shim subgrade before re-placing the reclaim material. Crushed gravel should never be used to shim on top of the reclaimed material because the less pervious nature of the reclaim material can cause water to be trapped in the crushed gravel between the reclaim material and the pavement.

306.2 – MATERIALS

Current Special Provisions describe the materials to be used as the existing bituminous surface and an approximately equal amount of gravel base that is either generated from the underlying base aggregate or added from a gravel source. The gravel base should substantially conform to Specifications for gravel or crushed gravel. The reclaimed base material is to be mixed in a windrow and pulverized sufficiently to free the asphalt to mix with the gravel. Any oversized particles should be reprocessed to meet gradation requirements.

306.3 – CONSTRUCTION OPERATIONS

The Contractor's proposed method of operation and equipment to be used should be reviewed prior to beginning work to ensure compliance with current Specifications.

Methods of reclamation vary from project to project depending on specific project requirements. Reclamation may be in place or at a different location. Typically, where a grade change is not major, in-place mixing will be specified.

In-place mixing places more demands on the project personnel than off-location blending. The inspector must monitor scarifying and pulverizing as well as inspect subgrade excavation. The inspector should see that the underlying subgrade is graded to Plan line and grade, resulting in a uniform and consistent cross-section. It should also be verified that all catch basin and manhole frames and covers are removed or visibly protected prior to the reclamation process.

Maintenance of traffic, especially in an urban situation, complicates the operation. The Contract Administrator or project personnel, or both, should note that a hammer mill type reclamation process requires considerable more room than a reclaimer does to “rip” and “windrow” pavement, scarify and pulverize the pavement, stockpile reclaimed stabilized base material, check subgrade excavation, and turn equipment around while maintaining traffic flow. The placing and grading of processed material should follow the scarifying and pulverizing as soon as possible so that traffic runs on the smoothest surface possible. As the process produces a large amount of dust during scarifying and from traffic passing over the graded stabilized base, maintenance of traffic should include ample provisions for dust control.

The Contract Administrator should note that fine grading of reclaimed stabilized base differs slightly from standard aggregate base courses. The use of water in this operation is very important to insure adequate compaction and workability during the fine grading operation. Reclaimed stabilized base packs extremely hard and has a tendency to bridge over less compacted underlying material. A sheep’s foot roller maybe required. If final grading is to be done after traffic has traveled on the reclaimed stabilized base, shimming at low areas, especially those with shallow depth, is impossible. Therefore, when grading the reclaimed stabilized base for traffic, the Contractor should leave the material slightly higher than “blue top” grade to allow for future cutting and grading just prior to paving. This grade should be checked by the Contractor with a string line or by other means before allowing the traffic onto the completed base and before blue tops are set.